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MATHEMATICAL PROBLEMS IN RELATION TO THE HISTORY OF ECONOMICS AND COMMERCE.*

By DAVID EUGENE SMITH, Columbia University.

If students of the history of economics and commerce wish to find a new and interesting field for exploration, and one which is certain to yield results that are worth the labor of cultivation, they will do well to consider the history of problems in arithmetic and algebra as set forth in the manuscripts and early printed books that have come down to us. No doubt some of this field has already been explored, but it is quite certain that only a small portion has thus far come under cultivation. The manuscripts on arithmetic from the thirteenth century to the beginning of printing, the large number of books printed before problems began to represent past as well as contemporary conditions, and the more original text-books of later periods contain a considerable amount of material on the history of commerce and economics that no one seems yet to have studied with any thoroughness.

Considered more broadly, a very good history of civilization could be written from the wide range of problems of mathematics. The emerging of humanity from the stage of mysticism, the development of the science of astronomy, the comprehension of the laws of mechanics and of physics in general, the transition from the agricultural to the industrial stage of a nation, the development of military science, and the rise of commerce are a few of the chapters that might be based upon the problems in mathematics which are easily accessible.

Returning, however, to commercial and economic history, a few examples will be cited to give some notion of the material at the disposal of the student. The problems in the manuscripts and early printed books on arithmetic in the fifteenth century tell us that Venice was then the center of the silk trade, although Bologna, Genoa, and Florence were prominent. Florence was the chief Italian city engaged in the dyeing of cloth. "Nostra magnifica Città di Venetia," as Tartaglia so affectionately and appropriately called her, carried on her chief trade with Lyons, London, Antwerp, Paris, Bruges, Barcelona, Montpellier, and the Hansa towns, besides the cities of Italy. Chiarini (Florence, 1481) indicates the following as the most important cities with which Florence had extensive trade, his spelling being here preserved: Alessandria degypto, Marsilia, Mompolieri, Lisbona, Parigi, Bruggia, Barzalona, Londra, Gostatinopoli, and Dommasco, with the countries of Tunizi, Cypri, and Candia. Tartaglia gives Barcelona, Paris, and Bruges as the leading cities connected with Genoa in trade a half century later.

We also know, from Chiarini's commercial arithmetic (1481), the most important commodities of Florentine trade in the decade before America was discovered. These were rame (brass), stoppa (tow), zopli (sulphur), smeriglio

* Extracts from a paper read at an informal session held on the evening between the meetings of the American Mathematical Society and the Colloquium at Cambridge, Mass., September 5, 1917.

(emery), lana (wool), ghalla (gall), trementina (turpentine), sapone (soap), risi (rice), zucchini (sugar), cannella (cinnamon), piombo (lead), lini (flax), pece (pitch), acciai (thread), canapa (hemp), incenso (incense), indachi (indigo), mace (mace), cubeba (cubeb), borage (borax), and the ever-present saffron, the "king of plants," then everywhere used as a *sine qua non* in daily life, and now almost forgotten.

The problems also tell us the cost of the luxuries and the necessities of life. Spanish linen was worth, for example, 94 to 120 ducats per hundred-weight, while Italian linen ran as high as 355 ducats and Saloniki linen as high as 380 ducats. French linen was much cheaper than the latter, selling for 140 ducats. The arithmetics tell us that the linen was baled and sent from Venice to towns like Brescia on muleback.

The problems "delle pigione" tell us that the houses of the bourgeoisie rented in Siena, in 1540, at about 25 to 30 lire per year, while a century later they rented in Florence for from 120 to 300 lire. We also have the prices of sugar, ginger, pepper, and other commodities, showing that these three, for example, were only within the reach of the wealthy.

Hotel life in a grand establishment is also revealed in various problems, of which this one, printed in 1561, is a fair type: "Item / Wenn in einem Gasthause weren 8 Kamern / in jglicher Kamer stünden 12 Bette / in jglichem Bette legen 3 Geste / vnd ein jglicher Gast gebe dem Hausgefinde 6 d trinckgelt / Wie viel thuts in einer Summa?" The conditions are not at all exaggerated, as many travelers in remote parts of the world to-day can testify.

The early printed arithmetics also show interesting changes in commercial customs and a general rise in the standards of business integrity. For example, the chapter on Die Regel Fusci, very common in the sixteenth century, and relating in part to the adulteration of foods and drugs, would hardly be acceptable to-day either in school or in trade.

The arithmetics also tell very completely the story of the transition from the era of barter to that of the sale of goods for a monetary equivalent. The chapters on "Il baratto," "Stichrechnung," "Troquer," and "Manghelinghe" are among the most interesting ones to be found in these books. They tell us of the influence of the great fairs, they give us lists of these commercial centers, they reveal the relative values of the various commodities in general use, they tell us of the custom of barter in futures (the forerunner of our dealing in futures to-day), and incidentally they explain why a truckman is so called in our time.

An extensive and interesting history of exchange could be written from the problems of arithmetic, including the "cambio minuto, ouer commune," the "cambio reale," the interesting "cambio secco" ("change sec," or "trockener Wechsel") which "non ha humore, ne foglie ne frutto," as Sarava wrote in 1561, and the "cambio fittitio." To these various forms we can trace our standard systems of to-day, and in the study of the "cambio secco" we can understand the law of Henry VII which says that "Eny bargayne . . . by the name of drye exchange . . . be utterly voided."

The transition from partnership in its various forms to the corporations of to-day may well be studied in the problems of the commercial arithmetic, and there may also be followed the genesis, partial decay, and present status of equation of payments. Profit and loss, to-day the most vital topic of business arithmetic, has a long and varied history, and the economics of the problem may be studied in the older books, free from all the modern features of overhead, cost of doing business, and profit on the selling price.

Not only to the economist and the student of commerce is the field a rich one, but it is well worth the study of anyone who may be possessed of doubt as to the relation of mathematics to the daily life of the race. Not only can the history of the problem easily be made the history of commerce and economics, but the history of mathematics can easily be made the history of civilization.

ORGANIZATION OF THE MARYLAND-VIRGINIA-DISTRICT OF COLUMBIA SECTION OF THE ASSOCIATION.

As a result of preliminary correspondence, a group of Maryland mathematicians held a meeting in New York at the time of the December meeting of the Association and presented a petition to the council for authority to organize a section of the Association in Maryland, Virginia, and the District of Columbia. Professor Abraham Cohen was designated as temporary secretary.

The authority being granted by the council, arrangements were completed for a meeting to organize the Section at Johns Hopkins University on March 3, 1917. Among the 38 persons present at this meeting were the following members of the Association:

- O. S. Adams, U. S. Coast and Geodetic Survey, Washington, D. C.
- Clara L. Bacon, Goucher College, Baltimore, Md.
- Harry Bateman, Johns Hopkins University, Baltimore, Md.
- Lillian O. Brown, Hood College, Frederick, Md.
- J. A. Bullard, U. S. Naval Academy, Annapolis, Md.
- A. B. Coble, Johns Hopkins University, Baltimore, Md.
- A. Cohen, Johns Hopkins University, Baltimore, Md.
- H. A. Converse, Baltimore Polytechnic Inst., Baltimore, Md.
- J. B. Eppes, U. S. Naval Academy, Annapolis, Md.
- Angelo Hall, U. S. Naval Academy, Annapolis, Md.
- W. M. Hamilton, U. S. Nautical Almanac Office, Washington, D. C.
- R. A. Harris, U. S. Coast and Geodetic Survey, Washington, D. C.
- A. W. Hobbs, Baltimore, Md.
- L. S. Hulburt, Johns Hopkins University, Baltimore, Md.
- W. D. Lambert, U. S. Coast and Geodetic Survey, Washington, D. C.
- A. E. Landry, Catholic University of America, Washington, D. C.
- Frank Morley, Johns Hopkins University, Baltimore, Md.
- S. F. Norris, Baltimore City College, Baltimore, Md.